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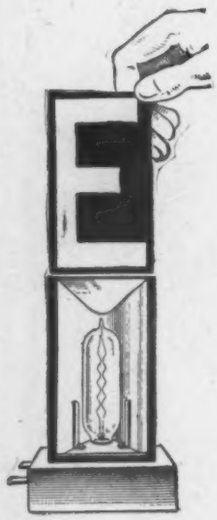

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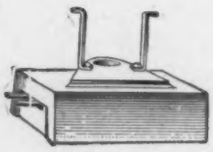

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JOURNAL OF ELECTRICITY
POWER AND GAS
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POWER CONDITIONS IN THE PACIFIC NORTHWEST

BY W. E. HERRING.

(The author directs attention to the fact that since 1910 all operating companies in the Pacific Northwest find they have a surplus of power with no immediate market, nothwithstanding the low charges made. The necessity for securing industries to utilize this surplus power is emphasized. Although millions of water horsepower is being wasted, development cannot occur until this is done. Incidentally, interesting facts describing what is necessary in plant construction and the difficulties encountered both then and during operation add greatly to the value of this article.—The Editor.)

Much has been written regarding the millions of undeveloped horsepower on the various streams in the Pacific Northwest. In all of the articles heretofore appearing, no reference has been made to the lack of a market for this power. Without a market for the energy, the finest water power developments in any section have no economic value. Up to 1910 there had been a rapidly increasing demand for power, which taxed the operating companies to meet. Subsequent to that date the rate of demand has not kept pace with that earlier established, with the result that all of the operating companies in the northwest find that they have a capacity in excess of that needed, varying from a few thousand kilowatts with some of the companies to a considerably higher figure with some of the others. Unless industries are brought into the northwest to absorb a portion of the power already developed, it will be some years before the construction of any new power plants will be warranted.

The increase in efficiency of the various electrical machines, the greater distance to which energy can be transmitted, and other advances made in the electrical industry, have all tended to decrease the price paid by the consumer for his energy, and rates all over the country have been constantly decreasing, until those at present in force with the larger companies are only from 35 per cent to 50 per cent of the rates in effect a few years ago. At the present time rates here compare most favorably with those in any other part of the United States. The lighting rate in Seattle of 6 cents per kw.-hr. for the first 60 kw.-hrs. and 4 cents for all over that amount, with a monthly minimum of 50 cents, is perhaps, as low a rate as is obtained in a city of any size in the United States. The

The Grandeur of Snow-Clad Mountains Reveals Sources of Perpetual Power.

rates in Portland, Ore., and Tacoma, Wash., while slightly higher, are about the same as in Seattle. Power rates to large consumers are, perhaps, as low as can now be had any place in the United States for similar service.

The states of Washington and Oregon are divided roughly into two parts by the Cascade range of mountains, which has an average elevation of 4000 to 6000 ft., with peaks in it ranging as high as 14,000 ft. The two portions of the two states are entirely dissimilar in character, the west side being in a moist climate with very mild winters and comparativly cool summers, while on the east side the very opposite condition exists, it being more of a desert country—hot and dry in summer and cold in the winter. Naturally, there is a marked difference in the precipitation, which varies from 10 in. per annum on the east side to as high as 120 in. per annum on the west side.

It is generally conceded that the streams on the west side of the Cascade mountains, in both Oregon and Washington, present unusually favorable conditions for water power developments. They have a rapid fall and abundant water. Their sources mainly being in perpetual ice and snow, it would seem that the stream flow would be comparatively well regulated, yet every operating plant in this territory needs storage to carry it over the two low water periods which are had on a majority of the streams—one being in February and the other in September or October.

The prevailing opinion among the general public is to the effect that practically all of the streams on the west side have splendid water power possibilities and that it is only necessary to locate one of them, raise the money to construct a power plant, and then figure some method of expending the supposedly enormous revenue derived from the plant. Operating people know only too well that this is far from the case and but few people realize the numerous difficulties which need to be overcome in the construction of the average power development. Usually, they are located in remote places, not reached by even a wagon road. With the great quantity of various construction materials needed and the heavy pieces of machinery which are installed in the power plants, it is almost a necessity to have a railroad to the site. The length of the road, of course, varies with conditions. One plant which is now under construction in the Pacific Coast section, necessitated the building of 56 miles of standard gauge railroad before any construction work was started on the power development. The materials which need to be transported, include, among other things, tons upon tons of steel for the construction of the pressure pipe, for the concrete reinforcement, and other uses in connection with the work; machinery and other equipment weighing hundreds of tons, generating equipment for a temporary plant used during construction, air compressors, head gates, water wheels, generators, and the other incidental machinery required in the power house; the transportation of an immense quantity of powder, cement, food and other supplies and material needed in the construction of a great work of this kind.

In addition to the power plant, there is needed, first, a transmission line to conduct the energy from the point at which it is generated, to the market. This distance varies in each individual case. At a plant which is now under construction in the western country, the length of the transmission line will be 240 miles, one of the longest in the world, and the transmission voltage will be 110,000. The supports for the conductor on this line, instead of being the usual wooden poles with cross arms, will be steel towers built on the ground and having a maximum spacing of approximately 800 ft. Such a line presents unusual difficulties in construction, which necessarily increases its cost. Even with the ordinary transmission line of wooden poles spaced approximately 150 ft. apart, there are many difficulties to overcome. Clearing of the line in itself, in a heavily timbered section, entails a heavy expenditure. All trees on each side of the line which might strike the line if they should fall, need to be cut to prevent an interruption to the service. This means in the northwest, that a very wide strip must be cleared, since the height of some of the trees is more than 250 ft. with an average of perhaps 150 ft. Contrary to the usual supposition, poles for the transmission line oftentimes require to be hauled many miles, although there may be abundant timber adjoining the line. Cedar is the wood most generally used, on account of its lasting qualities, and if it cannot be obtained locally, is often shipped in. The insulators for the ordinary 60,000 volt transmission line are from 18 in. in diameter at the bottom and weigh 27 lb. each. They do not, from the ground, appear to be this size, neither would one think they were so much larger or heavier than the ordinary glass or porcelain telephone insulator, which weigh less than 2 lb. The various camps sheltering the men who are employed in the clearing of the line, digging the holes, erecting the poles and stringing the wire, must all be supplied with food and the various material and equipment needed in their work, and in sections of the country lacking wagon roads the problem presented is a very difficult one. Construction of many miles of wagon road is imperative, and the amount of work involved in maintaining them during bad weather for the passage of heavily laden teams is a big task. The average cost for a high tension line in heavily timbered country using wooden poles, is $4000 per mile, while if steel towers are used, the cost is materially increased.

At the market end of the transmission line is a substation, into which the energy from the power house is conducted at the high tension voltage and reduced to a lower voltage for distributing purposes. Several lines may reach from this substation to other substations located in various parts of a city and from which substations the distributing system radiates to all sections of the city. The equipment in the substation consists of intricate and expensive machinery, again increasing the total cost of the work. The distributing system itself in the ordinary city costs from $8000 per mile in the overhead district where poles are used, to as high as $40,000 per mile for a six-duct lead in the underground section.

It will thus be seen that there are many things to be considered in addition to the power site itself. Further, when plans are being made for the development of any particular project, it is necessary to bear in mind one essential feature in this business, that is, continuity of service. In order to more thoroughly guarantee this, it is advisable to have a steam auxil-

iary plant, if only one power development is owned. The steam plant is often used also to carry part of the load during the peak, and by all of the larger companies a steam plant is had as a "standby" in order to more fully protect their consumers. In addition, storage batteries are usually supplied with a capacity sufficient to carry the entire load of the system for a length of time sufficient to allow the steam plant to be cut in. In Seattle the operating company has $270,000 invested in such batteries which will carry their load for twenty-five minutes only. Under such conditions if an interruption is had for any reason, such, for instance, as a lightning storm, the storage batteries can immediately be cut in and no interruption of service occur. Since fires are kept under the boilers in the steam plants night and day, it requires but a short time to get up sufficient steam to take on the load.

Briefly, these are a few of the difficulties which need be met and solved by all operating power companies. After a system is constructed there are many causes of trouble, all of which need to be constantly looked after and carefully and quickly repaired. Everyone is familiar with the trouble which occurs during an exceedingly heavy wind storm, lightning storm, or a heavy sleet or snow storm, but few people realize, however, the immense amount of trouble and expense such a storm may mean to the power companies. Miles of distributing system may be put out of commission, poles blown over or broken off, wires snapped, insulators broken, and such havoc wrought in a few minutes' time that many thousands of dollars must be

River Mill Power Plant and Amburson Dam—Portland Railway, Light and Power Company.

Puget Sound Traction, Light and Power Company—Electron Power Plant.

The Nooksack Power Plant.

expended to repair, and much time spent to recover from the effects. During such accidents, the advantage of having more than one transmission line, or of being able to transmit energy from more than one plant, is readily realized. If two or more plants are operated by the same company, each having its own transmission line, there is much less danger of an interruption to the service. This is one great advantage of plants being coupled up.

There is a loss of power from the power site to the consumer, of approximately 50 per cent. In other words, of each horsepower available at the power site, only one-half horsepower eventually reaches the consumer, which is about 70 per cent of the horsepower actually generated. The losses are experienced in the water wheels, generators, transformers, transmission line and distributing systems.

Contrary also to public opinion is the fact that the initial cost of a complete water power development is from two to four times the cost of a steam plant of the same capacity.

The light and power business in the western portion of the two states of Washington and Oregon is now transacted by several different companies. The Puget Sound Traction, Light & Power Company has four operating power plants and six steam plants in the Puget Sound region, and supply the entire territory from Tacoma north to the British Columbia line, with energy. Their total rated capacity is 105,440 h.p., of which 75,667 h.p. is in water power plants. This company is under the management of Stone & Webster.

From Tacoma south to the Columbia river, the southern border of Washington, a distance of approximately 125 miles, there are several small cities, all supplied by the Oregon-Washington Corporation, with energy which at present is supplied from two steam plants and one small water power plant. The total rated capacity is 3087 h.p., of which 887 h.p. is in water power plants.

The Pacific Power & Light Company supply a number of cities and towns from Hood River on the Columbia River, east, practically all of them east of the Cascade range.

The section from the Columbia River south to Salem, including Portland, Ore., approximately 50 miles, is supplied by the Portland Railway, Light & Power Company, from three water power developments and seven steam plants, with a total rated capacity of 81,267 h.p., of which 55,307 h.p. is in hydroelectric plants. A new company which has recently entered the Portland field, is the Northwest Electric Company with a hydroelectric plant in the state of Washington of 16,000 h.p. rated capacity, and a steam plant under construction in Portland of 5000 h.p. capacity.

From Salem, south to and including Eugene, Ore., approximately 70 miles, the Oregon Power Company, owned by the H. M Byllesby Company, furnishes all energy from two steam plants and one water power plant, with a total installation of 5616 h.p., of which 666 h.p. is in their water power plants.

The country from Eugene to Grant's Pass, Ore., a distance by rail of approximately 175 miles, is served by several small isolated central station plants. The California-Oregon Power Company supplied the territory from Grant's Pass to the California line, a distance of about 50 miles, included in which is Medford, the largest city in Southern Oregon. This company has in Oregon three water power developments, two of which have a capacity of 8300 h.p. and two water power plants in the northern portion of California.

From the above it will be noted that the largest operating companies in this section find it necessary to have large steam auxiliary plants, entailing an additional heavy financial burden, to carry them over the peak loads, and to practically guarantee uninterrupted service.

The water power plants already developed by the operating companies comprise, naturally, those sites nearest to a market, but does not include some of the better developments which are still available, although a greater distance from the existing markets. Under present conditions of transmission, the greater distance from market would entail but a slightly greater loss, perhaps, two or three per cent, only, in reaching the market with the energy, than is now had from the existing plants.

Notwithstanding the fact that the general idea is that there are no sites available for new developments, some of the very best possible developments,from purely the standpoint of cost of plant, have not been carefully investigated, for the simple reason that no market exists for the power. These powers are on some of the largest rivers in the two states and where the fall in the streams is particularly rapid. Contrary also, to the usual notion in regard to these projects, they are not owned or controlled by any corporation, and many of them can be filed upon by any one who chooses to do so. The interests now in the field do not want such projects for they could make no use of them.

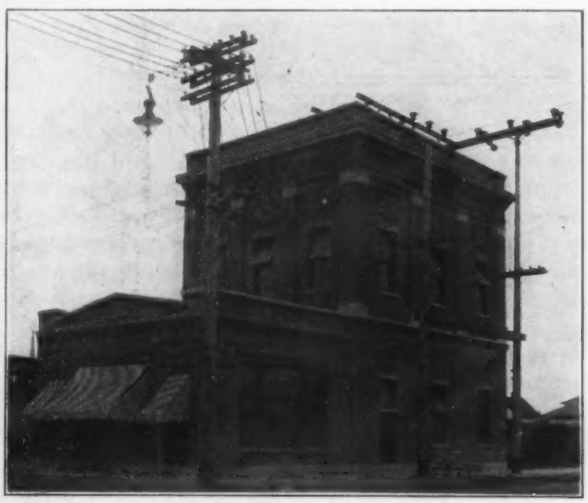
Scarcely a week passes that does not bring to the larger companies, at least one offer to sell a power site, but under present market conditions, it will be years before any interest can be manifested in these propositions. The larger companies recognize this situation, and since anything that will tend to build up the country in which they are operating will redound to their advantage, it is policy for them to assist in every material way in the upbuilding of this section. One company, at least, in the northwest has been cognizant of this situation and has instituted an aggressive campaign to secure additional industrial enterprises. Such a campaign is a new departure in this line of work, but it is realized that if the country is to be more fully developed, that additional manufacturing enterprises must be secured, and particularly is this true when the raw materials, markets and labor are already present. They are carrying on this campaign individually, but are co-operating in every consistent way with the various commercial bodies, and the results obtained will be of much interest to other concerns similarly situated. Extremely low rates or power are being offered as a special inducement for new enterprises. Rates less than $20 per h.p. year for 24 hour power have been quoted to prospective users of large blocks of power.

The power cost of manufacturing per month, assuming a use of 100 h.p. 10 hours per day, with a load factor of 75 per cent, in various cities, is approximately as follows:

White Salmon River Development—The Northwestern Electric Company.

Boston, $937.50; Philadelphia, $839.25; New York, $699.37; Chicago, $629.43; Cleveland, $559.50; Pittsburg, $417.62; Buffalo, $184.91; Seattle and vicinity, $150 to $375; Niagara Falls, $144.17.

The Seattle rate depends upon the amount of power used and the location of the consumer with relation to the generating station.



Springfield Substation—Oregon Power Company.

Power is but one of the four essentials which are needed to build up a manufacturing community. First, are the raw materials; second, the markets, including transportation; third, the labor, and fourth, the power. The conditions existing in this section are materially different from those in the eastern part of the country, where with a dense population, practically an unlimited market, resulting in numerous and diversified industries, the demand for power is extremely heavy, and as a result, streams with but a light fall have been harnessed to supply the needs. Low head developments are the rule rather than the exception, while in the northwest there are no low head developments and practically no attention has been paid to even the larger streams where such developments could easily be obtained.

It is granted that there are unlimited power possibilities on the various streams in the states of Washington and Oregon, but at the same time it must be remembered that until the country is more densely populated and there are more industrial plants located here, there will be no such development of these streams as has taken place in other parts of the United States.

Jupiter's Trial Run.—The electrically-driven collier Jupiter has made a successful forty-eight hour trial run off Santa Barbara. Captain F. M. Bennett, commanding the Mare Island Navy Yard, telegraphed the Navy Department that the ship averaged 14.78 knots an hour for forty-eight hours, or more than three-quarters of a knot per hour above her designed speed. The Jupiter is an experiment in naval construction, and her subsequent performances will be watched with the keenest interest, in comparison with the collier Neptune of the same size, but using the new reduction gear instead of electric dynamos and motors to bring the high speed of her turbines down to a workable and economic basis.

DISPOSITION OF LOS ANGELES AQUEDUCT POWER.

BY WM. VAN DEN HEUVEL.

(The writer brings out certain pertinent facts regarding the Los Angeles aqueduct power project as an aid to a proper and complete understanding of the situation, and presents a basis upon which negotiations for power disposal might be conducted. Mr. Van Den Heuvel is a consulting engineer, with offices at 701 Central Bldg., Los Angeles, Cal. The paper was originally read before the Los Angeles Jovians.—The Editor.)

The power generated under the aqueduct flow is a commodity to be placed at the disposal of the citizens of Los Angeles or Southern California in a manner to effect the most good to the community at large. The Aqueduct Power Bureau, the officials of the city of Los Angeles, in fact those responsible to the people of Los Angeles for the judicious disposal of this power are confronted with the problem as to what form of disposal will produce the most good.

The problem seemingly simple is put under limitations and restrictions, legal, financial, technical and commercial affording an ideal means to do injustice to some of the parties involved. Vitally interested are, at present, principally the aqueduct bureau, the city officials and perhaps existing power companies now engaged in the distribution and sale of power for lighting and various other purposes.

The sale of electric power as a public necessity is now subject to regulation as to rates and character of service, and the city maintains a commission for the special purpose of making such regulations. Rates once approved by this commission are considered to represent a just charge by the company, taking into account all charges and expenses involved in the production and distribution with added thereto a fair profit. This form of supervision protects the consumer against unjust charges by power companies, and insures adequate and satisfactory service under every variety of use of power. The method was first adopted in the State of Wisconsin, soon followed by other states and has helped materially in establishing good business methods and good service on the part of public utilities. The mere fact that the books of these public utilities are subject to examination by the commission has caused the value of their securities to become more sound in the eyes of investors. The jurisdiction of this commission is such as to entirely safeguard the interests of the general public.

The aqueduct power as a general scheme may be distributed in two ways. First, by the use of existing overhead and underground distributing systems as now owned by the power companies; second, by means of new distributing system to be constructed and operated by the city.

The latter arrangement will mean a wasteful duplication of at least certain parts of systems already existing; it further produces competition comparable with competition as now existing between local telephone companies serving the same territory and who, by skillful manipulation have succeeded to graft themselves on the general public, making it pay twice for service which might well be provided by one company, particularly if this company is dependent upon the approval of a commission which has the jurisdiction to enjoin them from doing business unless according to standards established by the commission.

The first method of power disposal has evidently been recognized by the aqueduct board to offer the only practical basis for negotiations. The question still unsettled is, who shall own the distributing system, and present dealings with the power companies have been for the purpose of acquiring such parts of the existing distributing systems as may be necessary for the disposal of the aqueduct power.

The question as to whether or not the city should own a distributing system involves the comparison of the relative abilities of the city and of the power companies as far as the sale of power is concerned; it involves legal points, the city charter in its present form appearing to prohibit the bulk disposal of the power to existing power companies; financial points involving the bonding capacity of the city, and last but not least, public opinion as expressed in a popular vote based upon an intelligent understanding on the part of each voter as to the manner in which interest on outstanding bonds or bonds yet to be issued may be earned without making him pay twice for the same service. It is clear that the voter may be made to bear his share of the expense of power service, first, by taxation or rather increased taxation, second, by his monthly light bills.

It is obvious that the rates for light and power considering the natural growth of the city will only stand for downward revision from year to year. Therefore, no matter whether the distributing system be owned by the city or by the power companies, the individual consumer is not likely to obtain his light and power for less than what he is paying now, unless under revised rate schedules as will be approved by the public utilities commission. The consumer or voter therefore wonders in what manner his taxes may become affected by the construction of a municipal distributing system, granting the fact that it cannot increase the tax rate on the ground that the distributing system would first of all be self-supporting. It thus remains to decide whether the city is able to distribute power cheaper than the existing power companies purely as a matter of business ability, not of profits since the amount of profit in either case is clearly defined by the regulations of the public utilities commission.

The existing power companies operate their systems as a matter of business for the profit obtainable therefrom; they have set themselves certain standards in the employment of men and salaries paid; they have defined policies followed in securing new business. In the nature of things, it is the object of their business organization to reduce expenses to a minimum, thus causing returns to be as large as possible. The men employed in and in charge of the various departments are selected on their merits only, and are usually able to retain their positions as long as they prove valuable to their employers. They are not subject to civil service commissions or dependent upon political influence for the continuity of their services.

The civil service form of employment was devised in connection with the management of municipal affairs as a first step to avoid political influence in the selection of men for public offices. Civil service has as yet no jurisdiction over most of the executive offices, and this is entirely due to practical conditions

which make it well nigh impossible to fill such executive positions through examination and competition. While some new form of city charter may place the city in a better position to conduct the business of its numerous branches on sounder lines, it does not establish that the city can distribute power cheaper and better than corporate organization.

The organization on the part of a municipality for the purpose of getting new business, is usually small and considered as only incidental rather than of great importance. The comparison here with the corporate company brings out the fact that often a municipally owned system is liable to suffer from stagnation, extensions are made according to need rather than in anticipation of future requirements. Extensions must be financed through additional bond issues, under approval of the people. Recently in the State of Kansas, a municipally owned electric lighting plant and distributing system was turned over to private interests for operation, while originally, the system was built by private capital, afterwards acquired by the munipality. It proved, however, that operation by the private company largely increased the amount of new business acquired each month.

The matter of future extensions and the plan of financing such work, is quite similar to conditions now obtaining in the water department and under discussion with the Los Angeles Realty Board. The question now pending, involves proper charges for new water service connections. It has been advanced that there exists an injustice in making the charges for water to old consumers bear the cost of such extensions rather than to cause the new consumers to pay for the expense involved on a front foot basis of assessment. This theory was advanced recently by one of the city officials, and a certain amount of explanation was given for the theory. However, it was omitted to mention the fact of benefits to old consumers through the addition of new connections, and caused by the gradual enlargement of the system which brings along a reduction in the cost of production, meaning that with the growth of a city, water can and should be supplied at gradually lessened rates. Levying of assessments, places new consumers on a basis different from existing consumers, and if there exists justification for a difference, then it should be introduced by a means of the cost of water, not by means of a scheme of financing different from and in addition to the existing method whereby bonds are issued for new funds needed, and in the event that such moneys are not available from the gross returns of the total water system.

These arguments apply directly to extensions necessary for the power distributing system. It would hardly appeal to public opinion to acquire the existing and required distributing system through assessment of the individual consumers of the territory just served, while the plan to finance extensions in this manner would establish a precedent in the business of distributing electric power in cities. The assessment plan is now used in the distribution of power to remote agricultural districts, though the money thus advanced by the consumer is returned to him in the form of discounts on his monthly bills until the power company has thus paid for and acquired the extension.

Applying the refunding idea to an assessment plan, we get a tangible business proposition for the power distribution, while under the adoption of this plan with extensions of mains by the water department holders of large tracts of land for subdivision would find themselves obligated to finance these extensions for the length of time required to wipe out the principal through discounts applied over a limited period of time.

The aqueduct power obtained from a series of water power plants located a considerable distance from Los Angeles must necessarily be produced at a cost which will compare favorably with the cost of manufacture of electricity by means of steam plants such as are now operating in Los Angeles and vicinity. To the layman it seems obvious that the power from water that would otherwise go to waste, is cheaper than that produced with steam plants. The fact is not quite so obvious when it is realized that the investment in a water power plant and transmission lines may be four to five times as great as in the steam plant of the same capacity. When in addition to this we have a condition whereby the load on a power station lasts only a few hours each day, it becomes evident that during a greater part of the time, most of the machinery is idle; that therefore it pays to have as little money invested in the power station as possible in order to reduce interest charges against the investment.

Applying the above facts to conditions obtaining in Los Angeles, and further applying them to the considerations in the disposal of the aqueduct power, it becomes pertinent how the cost of aqueduct power compares with the cost of other power now used by the power companies. In order to make such a comparison fair, we must select power similar in character of service which it provides. It is logical to assume that if the city of Los Angeles is now lacking in power facilities, this lack will make itself felt during the hours of maximum demand; that therefore, the immediate value of the aqueduct power will be as peak load power. Whenever peak load power demand exceeded the capacity of the existing power stations, it has become necessary to provide additional power units, and under the most approved and modern methods, steam turbines of large capacity have been used. Comparatively small additional investment at the power station places power companies in the position of meeting satisfactorily these peak load demands. For this reason it appears that really aqueduct power may not be very desirable to fill present peak load shortage in the demands of the city.

The majority consumer is essentially a peak load consumer using power for only a few hours per day. We thus find that most consumers are not directly interested in or served to advantage by the introduction of aqueduct power for this purpose. In order to make this point still clearer, we may add that all power companies now have surplus power available for sale during all hours other than peak load hours; that as far as actual need goes, they are not desirous of buying aqueduct power for distribution unless it can be had at a figure comparing favorably with their own cost of production during whatever period of use.

The above is intended to illustrate that it will be a matter of best advantage all around, with benefits to the community at large, that the aqueduct and ex-

isting power companies co-operate in a manner whereby the power needs of the city are filled through a combination of the aqueduct system with existing systems. This combination to refer not only to distributing systems but to generating systems as well. Such a combination would insure the use of aqueduct power where it would be of most advantage, while steam power would be used whenever the physical facts proved to be more advantageous. The suggested co-operation between the aqueduct and the power companies would make necessary an equitable arrangement, compensating each party to the extent of the service rendered, whether in the capacity of a power producer or, as a power distributor, and the board of public utilities by means of approved rate schedules now effective, would be the medium of control of such an arrangement.

It would seem that negotiations to date have failed, principally due to the difficulties presented by the basis upon which these negotiations have been carried on. It is believed that there has been a tendency on the part of the aqueduct to depreciate the value and importance of emergency service, such as would have to be rendered by other generating systems now operating in the city, and which would have to take the municipal load during interruptions. The capital outlay for emergency service is considerable, and it would be difficult to arrange for this unless under a plan of co-operation between all parties concerned. By co-operation, the provision of emergency service would be mutual, and the value of emergency service would be a tangible proposition. In view of this fact, the aqueduct power should be sold for less than what the power companies can produce power for themselves.

While the development of the aqueduct power as a matter of economics is a most desirable undertaking, it seems hardly fair to expect this development to be from the outstart, not merely self-supporting, but highly remunerative also. Marketing of power is the vital problem in the development and success of the enterprise, and we might, in these negotiations, come face to face with the perplexing problem of expecting power companies to acquire additional power at too high a cost, and at a time where the market within the city limits is not really in dire need of it. It has been stated lately in some of the newspapers that the profits due to the sale of aqueduct power may go far in paying interest on aqueduct bonds in addition to interest against aqueduct power bonds. If this argument is made to apply to the disposal of aqueduct water for irrigation purposes, and in the charges to be made therefor, it becomes clear that an apportioning must be made of the total combined cost of aqueduct and power development to water and power charges respectively. No figures have appeared thus far stating what part of the expense of the aqueduct construction may rightfully be charged against the production of power in addition to the mere cost of power plants and transmission lines. Pending such considerations, we are face to face wtih the creation of a possible revenue from power sales, provided that a fair arrangement can be made causing immediate returns.

It is suggested that as a future basis for negotiations, present rate schedules approved by the public utilities commission be subjected to a pro rata division; that the city, in co-operation with existing power companies, agree to take a percentage of the gross returns for such total service as it may be desirous of rendering to any or all of the power companies; that this percentage be in terms of the physical value of the part of the equipment involved in such service; that the percentage be chosen to duly allow for the character of service, if necessary arranging for emergency service by penalizing the city for interruptions at the rate of from $500 to $1000 a minute; also that the percentage in fairness to all parties be made to account for the amount of risk involved in the particular service rendered and the investment required therefor.

The above basis would make the city substantially a power distributor, receiving compensation to the extent of service rendered. It is realized that a somewhat similar plan has already been proposed under a division of profits. It is evident that it would be considerably more difficult to negotiate on this basis than on the one suggested herewith.

By metering the total aqueduct power as supplied to the power companies and computing the percentage which it represents of the total meter output of the company could easily be determined, and a speedy accounting on the books of the power companies would be possible. The accessibility of the power companies' books to the utilities commission constitutes a safeguard of the people's interest in this direction.

San Fernando Valley at night is now a blaze of light from Lankershim to Owensmouth. The ornamental system previously installed in Van Nuys and Owensmouth has been extended to include the entire length of Sherman Way. On Saturday, November 1st, the Newberry-Bendheim Company completed the installation of the ornamental posts under its contract, which, with those previously installed, brings the number of posts installed up to 415. The posts are of cast iron, and are modelled after the design used on Hill street, Los Angeles. They are provided with five lights each in the towns of Van Nuys, Marian and Owensmouth, and the services are all underground in these centers. In the territory outside these communities the posts are provided with three lights, and the feeders are installed on a pole line on private property, the services being underground, so that the effect of a complete conduit system is by no means destroyed. B. F. Kierulff & Co. has the contract for an additional installation of 188 posts on what is known as the Ventura Road, which is part of the state highway system. Altogether the effect at night is startling, and appeals to one as a marked advance in suburban life. The distance between Lankershim and Owensmouth is approximately 15 miles, and this entire distance is illuminated superior to many more metropolitan districts. The Llewellyn Iron Works furnished the posts and the Southern California Edison Company supplies the current and will provide regular maintenance.

ELECTRICITY IN DRIVING THE KOOLAU TUNNEL, HAWAII.

BY R. REID.

(Touching upon irrigation methods employed in the Territory of Hawaii, the author, in referring to a particular project on Oahu Island, describes in an interesting manner the temporary electrical equipment used in connection with driving a 3-mile tunnel through the Koolau Mountains, through which a flow of 50 million gallons of water per day is expected.—The Editor.)

The principal industry of the Territory of Hawaii consists of growing cane sugar and milling the canes at the various sugar factories to extract the raw sugar which is shipped direct to the refineries on the Bay of San Francisco or routed by the American-Hawaiian Steamship Company's huge freighters via the Tehauntepec railroad to the Eastern States. The canes are raised either by the dry land method which is rather restricted due to uncertain rainfall giving small tonnage yield per acre of cane, or by

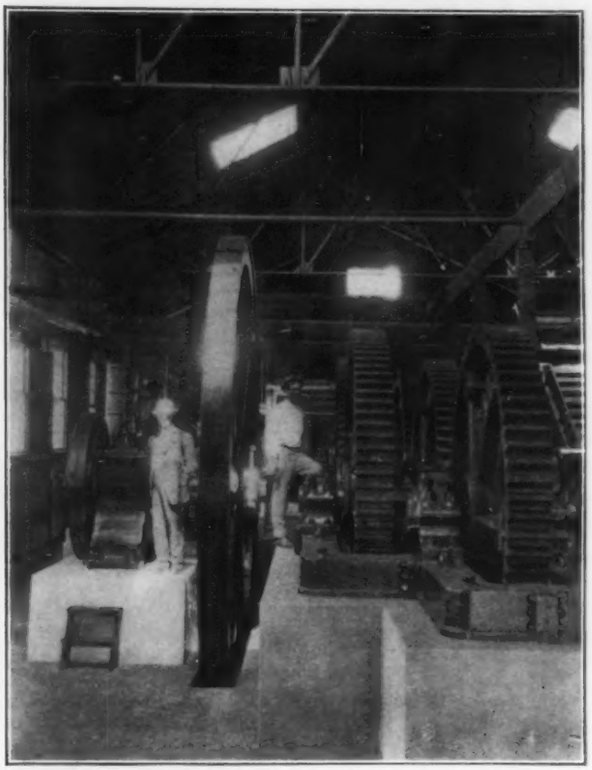
North Portal, Koolau Tunnel.

the usual and highly developed methods of irrigation now extensively practiced in Hawaii. In the majority of cases the plantations lie along the coast and water is brought to the thirsty cane fields, from the mountainous regions where the natural run off, rainfall and seepage is collected and conveyed by means of canals, tunnels, pipe lines or flumes to the distributing reservoirs located on the plantation area. Another method of procuring water, although usually one more expensive than the above is by means of steam or electrically driven pumps.

This latter method is used in supplying water for the Oahu Sugar Company's plantation located on the island of Oahu, about fifteen miles north of Honolulu and the total pumping capacity of the combined units here averages sixty million gallons per day, which is raised to various elevations.

For the purpose of increasing the area under cultivation the above company intend reclaiming land lying about 600 ft. above the sea level and in order to irrigate has decided to bring water from the eastern part of the island through the Koolau range, by means of a main tunnel and several miles of lateral tunnels on either side of the range. In order to carry on this project the Waiahole Water Company was formed. The main tunnel when completed will be three miles in length and has a cross section as shown in the accompanying illustration. As is usual in driving a tunnel of this nature where an adit cannot be made along its length or shafts driven from the upper surface, headers can only be worked from each end and the driving of the Koolau tunnel is proceeding under the latter method having north and south portal heading.

The Koolau mountains extend along the eastern side of the island of Oahu in an almost unbroken precipitous range and on the eastern side precipices as high as 2000 ft. are formed. Moisture laden clouds blown by the N. E. trade winds in from the vast



Interior View Oahu Company's Sugar Mill.

expanse of the Pacific, bank up against this range and condense on the cold mountain tops causing most of the run off to be toward the eastern side of the island.

When the Koolau tunnel is completed it is estimated that about 50 million gallons of water per day will be conveyed through it to the cane fields on the western side.

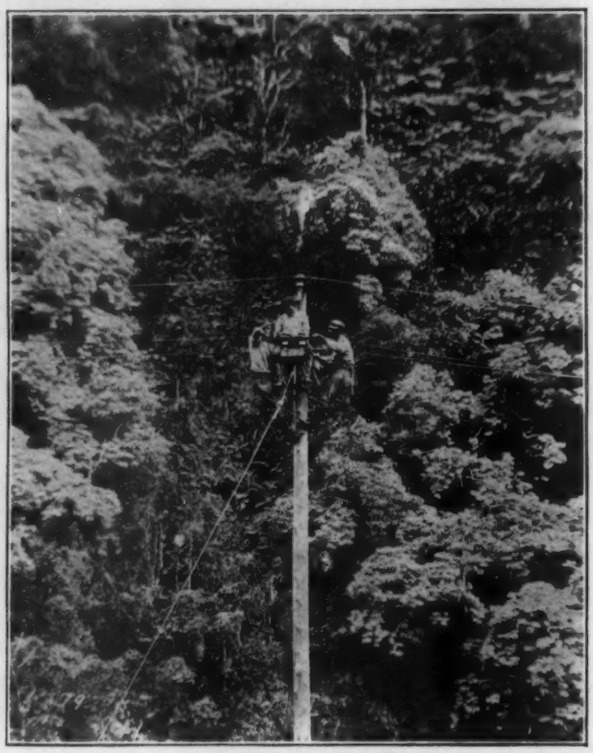
Before electric power installations were ready the drilling was done entirely by hand drills, some 300 ft. on the north side and about 2000 ft. on the south portal being driven in this manner.

The machinery when completely installed at the south portal will consist of the usual necessary equipment for tunnel work; air compressor, blower, drill sharpener, compressed air drill and a number of machine tools, such as lathe, shaper, band saw, rip saw and drill press. Besides these, motor driven machines

a motor generator set is to be installed for charging the storage battery locomotives, which are used in hauling the mucking cars, running on a narrow gauge railroad from the portal to the header and to the dumps.

A 100 h.p. 440 v. three-phase Allis-Chalmers induction motor drives the air compressor which is an Imperial type 10 Ingersoll-Rand machine, with intercooler and has a capacity of 375 cu. ft. per min. at 100 pounds per sq. in.

From the compressor receiver a 6 in. galvanized iron pipe carries the air to the header pneumatic drills. Two machine drills are used in each header and are mounted on an iron bar placed across the header and braced with wedges and in this way holes to receive the dynamite charge are drilled in to a depth of 7 ft., by using sets of drills varying in length from 3 to 7 ft. A round of five holes is drilled, the charges placed and at a safe distance back from the header a switch is thrown to shoot the round.



Transmission Lines.

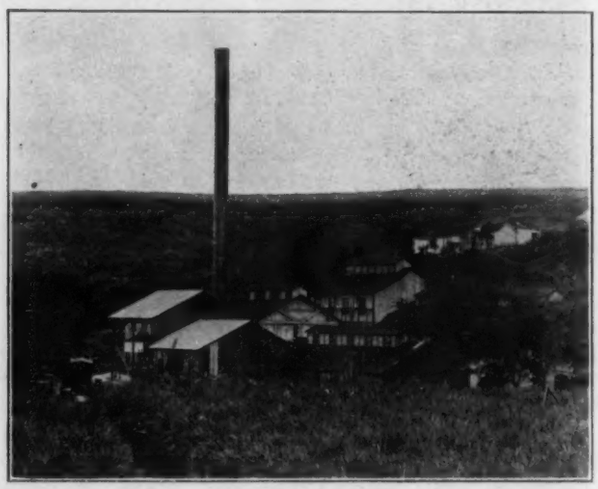
The blower is driven by a 15 h.p. 440 v., three-phase Allis-Chalmers induction motor and at the entrance to the 16 in. pipe line which runs into the tunnel to within 100 ft. of the header, there is an arrangement of small doors by means of which a suction can be produced such as is done after shooting the round, or straight blowing can be continued while the direction of rotation remains unchanged.

The drive for the machine shop consists of a 20 h.p., 440 v., three-phase Allis-Chalmers induction motor, belted to the line shafting from which all the machine tools are driven. A 15 kw. motor generator set 440 v., three-phase to 110 v., d.c., is used to charge the Edison 63 cell storage battery units of the Jeffery electric storage battery 3-ton mine locomotives. These are of the narrow gauge single truck double motor type.

Several 15 h.p. 440 v., three-phase Allis-Chalmers induction motors to drive concrete mixers, sand rolls, etc., will be installed later when work is began on the concrete lining of the tunnel.

All of the above drives will receive power from the south portal substation consisting of 3-60 k.v.a. single phase 11,000/440 v., oil insulated air cooled Allis-Chalmers transformers connected. Burke high tension (11 kv.) air brake switches, choke coils, lightning arresters and fuses are placed between the transmission line and high tension bus bars.

The 11 kv. transmission line extends from this substation six miles to the power house and is composed of 30 ft. cedar poles with cross arms and ridge pins making a triangular construction; the distance between wires being 40 in. and the average span 160 ft. In places where larger spans were necessary double cross arming was employed and the poles on either end well braced by side and head guys. The line is light construction, being No. 4 copper throughout.



The Power Plant.

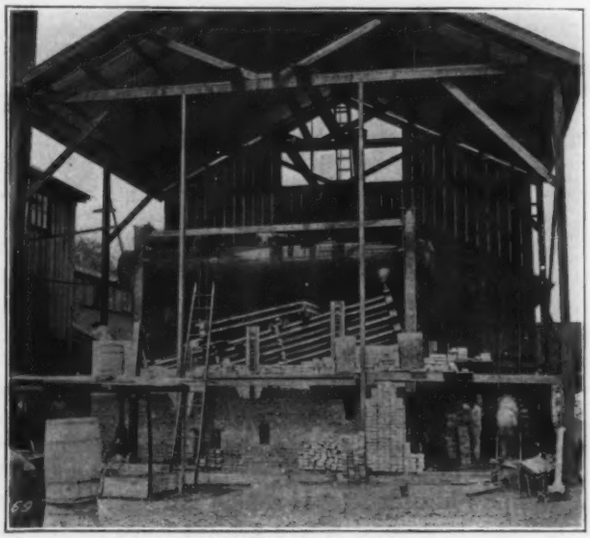
The power house is located on the Oahu Sugar Company's railroad about six miles southwest of the south portal. At present this small isolated plant is composed of a complete equipment for steam generation. Two 250 h.p. Babcock and Wilcox boilers with Foster superheaters supply steam at 175 pounds per sq. in., for a 300 k.v.a., 2300 v., three-phase, 60-cycle, 3600 r.p.m. Allis-Chalmers steam turbo generator. Fuel oil is used and supply storage tanks are located close to the railroad.

The building is a wooden frame structure, consisting of a boiler room, 37 ft. x 30 ft. and 33 ft. high, and a turbine room 37 ft. x 30 ft. and 24 ft. high, each of the parts having their sills on separate light concrete foundations. The boiler room gable wall separates the boiler room from the turbine room as shown in the accompanying illustration.

The turbine runs condensing, the condenser being located in a concrete lined pit directly under the floor of the turbine room. The foundation for the turbo-generator consists of two supports one on either side of the condenser pit and in this way the whole machine straddles the pit and sufficient room is afforded for the 16 in. exhaust pipe valve, and two expansion joints connecting the turbine with condenser.

The steam line is 4 in. and between the separator

and the main header has a bend and valve. The auxiliaries are all piped from the same header. In starting or running light load the turbine exhausts to the air and for this purpose has an atmospheric exhaust and an 8 in. pipe line to the exterior of the building, where an exhaust head extends above the roof. The bearings are oiled throughout by a small steam duplex pump mounted on the bed plate of the turbine.



Boiler Installation.

A Wheeler surface condenser, with air pump immediately under it is used and 100 gal. per min. circulating water is pumped from the sump of a nearby high lift pump by means of a 15 h.p. Kerr steam turbine directly coupled to a double suction 6 in. centrifugal pump.

The exciter is also driven by a Kerr steam turbine, this unit being 15 kw., 120 v., 3600 r.p.m.

Three 125 k.v.a., 2300 to 11,000 volt single-phase oil insulated water cooled raising transformers are installed in the turbine room. The bus bar construction

Engineers' Camp, Koolau Tunnel Project.

is of 1¼ in. black railing pipe and surmounts the transformers carrying a single set of three-phase bus bars for the high and low tension and having braces at right angles to the top cross bars, extending out to the switchboard. The latter for this small plant consists of a single panel on which are mounted the meters for both generator and exciter and also the oil switch between the incoming leads and the low tension bus. On the high tension side between the line and bus bars and just outside the building wall, the air brake switches, choke coil, lighting arrester and fuses are mounted. These are of the same type as mentioned before being Burke horn air switches.

On the north portal heading hard blue lava rock was encountered at a short distance from the portal and an Ingersoll-Rand Imperial type 10,375 cu. ft. per minute, air compressor was installed and belted to a 3 cylinder 150 h.p. gasolene engine having a clutch between the driving pulley and engine shaft. It is intended to replace this temporary installation later with a 100 h.p. induction motor drive. The machinery for the north portal was ordered in almost exact duplicate to that for the south portal, but at present only a part of the consignment has been installed. At this portal a 27 million gallons per day flow of water was recently struck in the main header and since there is sufficient head here for developing hydraulic power to operate all machinery for the north portal with a minimum of about 6 million gallons per day flow the pole line has only been constructed as far as the south portal.

All of the machinery is installed in a substantial manner, although its use will be only temporary as the company intend to salvage it on the completion of the Koolau Tunnel.

THE JOVIAN COMMERCIAL DIVISION.

BY ELL. C. BENNETT

As expressed in aptness and verity by one Jovian—"The Jovian Order for many years has been a sleeping giant." To convince that this condition of somnolence is truly of the past, that the giant has awakened to full realization of the possibilities inherent in his strength, one has but to study the progressive measures adopted by the Eleventh Annual Convention of the order in New York City.

These included many plans for the further propagation of Jovian goodfellowship, fostering of the social features, and one enactment of particular merit, of splendid possibilities bearing upon the practical side of Jovianism. This was the authorization of a Jovian Commercial Division. It is with the object of giving briefly the reasons for and an explanation of that plan that this article is written.

The title "Jovian Commercial Division" is in a sense a misnomer in that it might be taken to imply a "division" of the Jovian Order, whereas it is not intended at all to accomplish that catastrophe, but, on the contrary is created for the express purpose of cementing the members of the order into one indissoluble unit, by giving those members a practical reason, a tangible object, for so coming and remaining together.

The commercial division is a "division" only in-so-far as the Jovian central offices are concerned. It means simply a concentration of Jovian effort along certain well defined lines guided by a division of the central offices which has only that work to do, and its salvation, doing it successfully. It is purely the establishment of a concrete force, a means, to surely accomplish the practical things Jovianism has espoused for years, without interfering with the continued growth and expansion of the social phases of the Order.

Briefly, the organization to accomplish this consists of the reigning congress in the capacity of a board of directors, Mercury as active executive, or general manager—these men without salary—and two clerks under pay, the total maximum annual expense being $2500.

It cannot be otherwise than the hope of every man with belief in the practical value of co-operative effort, and with ambition for the permanency and added glory of the Jovian order, that a legitimate means of further financing the commercial division will be soon found by the Twelfth Jovian Congress. The generosity of the Jovian order itself in its donation to the entire industry, Jovians and others, of its funds and organization is an inspiring precedent, particularly so when it is remembered that this comes largely from the rank and file, from men of moderate income and comparatively humble position.

Commercial Division Plans.

First: A systematic campaign to establish a Jovian League or Chapter in every city having a Jovian membership of fifteen or more.

Second: A plan to provide on a self-sustaining basis permanent club rooms for each Jovian League. These rooms to be regulated in size and expense to meet the present and prospective demand upon them. To be supplied with electrical publications, magazines and libraries, writing facilities, chess, checkers, billiards, where the membership justifies such an expense, and the usual requisites of similar club rooms. Rejuvenations, joviations, luncheons can be held in these rooms. To the traveling Jovians they will prove a particular boon.

Third: Schools in connection with the club rooms, to meet the need of better instruction of salesmen of electrical supplies, devices, apparatus and power. This plan to be operated in a similar manner to that now successfully employed by a few central stations.

Fourth: Co-operative electrical display rooms in business and residential sections of cities.

Fifth: An employment bureau where will be listed with a brief outline of their experience and qualifications all those Jovians who are out of employment or seeking an opportunity to better positions they hold. Also a list of positions for which men are needed. To insure the success of this bureau, information given to it will be considered confidential and possible contracting parties will not be brought together until the sincerity of both is established. Information will be kept in card file form, cross-indexed.

Sixth: A campaign for more uniform and efficient inspection of electrical construction. This is to be handled by local Jovian committees of mixed interests under suggestions from the central offices and in co-operation with local inspectors.

Seventh: A plan to provide licensing of electrical contractors where such action is needed. This work to be prosecuted through local committees.

Eighth: A campaign to secure practical co-operation of architects with a view to having them both specify proper electrical material, and see that such specifications are fulfilled to the letter. This also to be worked out by the aid of local, mixed committees.

It is well to add here that the three last named plans were approved and authorized by both the Ninth and Tenth Annual Conventions of the Jovian Order; but, through lack of such a tool as the commercial division were never prosecuted after going to committee.

Ninth: Preparation and distribution of educational matter relating to the uses of electricity—simple definitions of its terms, etc.—upon which the general public should be better informed.

Tenth: Encouragement of and assistance in organizing local electrical expositions.

Eleventh: Providing speakers, on electrical and public utility subjects, for clubs and civic bodies.

Twelfth: Supplying the daily press with pertinent news on current electrical topics.

Thirteenth: Providing an "Electrical House" on a co-operative display basis for the Panama and other expositions, state fairs, city exhibitions, etc. These houses to show not only all the usual types of electrical devices with which the public are famliar, but to be so constructed that they will exhibit by cut open base boards and walls correct and sufficient wiring and placing of outlets.

It is obvious that the commercial division cannot hope to accomplish all of these and other plans within a short space of time. It can and will, however, show progress in the prosecution of them and eventually put them all into effect. If a plan is found to finance the division to a point where greater force can be put behind each movement than its present financial limitations will allow, where more and heavier ammunition can be furnished its local organizations, then, when we consider the tremendous power wielded by scores of these local chapters driving forward with unity of purpose, we can confidently expect early and highly efficient results.

The aqueduct power distribution problem now seems nearer solution. Mr. R. H. Ballard, representing the three lighting companies, has reopened negotiations with the City Council on proposition number two, known as the Agency Plan, submitted to the Council's Aqueduct Power Committee several months ago. The scheme, as now formulated and which has been clarified of all doubtful features, proposes the employment by the city of the power companies to distribute aqueduct power over existing systems, which are to be leased to the city. The latter will thus deal directly with the consumers, contract with them for light and power, and fix the rates to be paid by the consumers. The companies will distribute the power, and be paid for this service at a rate to be fixed by mutual agreement. Included in the scheme is the proposal to submit to the California Railroad Commission all phases of the proposition, and to this end Mr. Ballard and City Attorney Stephens have been authorized to confer with the commission to ascertain if, under existing conditions, it can be induced to participate in the solution of the problem. The scheme further includes ultimate ownership by the city of the distributing systems, but the details of this portion of the project are not yet worked out. There is a marked feeling of confidence that the power companies are willing to meet the City of Los Angeles on any reasonable proposition.

THE SYSTEMATIC CANVASS.

BY R. B. MATEER.

[Touching upon the losses occasioned by haphazard methods, the author points out the advantages of systematically keeping in touch with customers and its influence upon improved load factor.—The Editor.]

Have you systematized your new business organization; do you know your cost per dollar of revenue contracted? Are your records up to date? Do you know how many of your consumers are using electrical appliances? Are you sure each consumer secures what he is paying for—"good service?" Are you anxious to improve the load factor of certain classes of business? When your directors ask for information, is a reply given them that is merely an approximation? Systematic commercial effort and thorough canvass of all consumers solved many of the great difficulties for other aggressive companies. Why not for you?

A famous student of public utilities recently estimated that the sum of sixty million dollars was wasted annually in the electrical industry in competitive effort, without advancing materially the use of electricity for domestic, rural, and industrial purposes. That such a sum is each year expended, is not surprising, when it is considered that the campaigns undertaken in behalf of many companies have as their object, merely the securing of contracts—business that may be connected to the distribution systems, with a view of forcing an early sale of one company to another at a good profit.

If, prior to the indiscriminate signing of contracts, such funds as are normally appropriated for commercial sales effort, were disbursed in a comprehensive canvass of the territory served, business of value, possessing good load-factor and high power-factor would be encouraged, and the analysis of existing conditions would determine along what lines of endeavor sales effort is productive of a maximum return in revenue. Not only will a careful canvass be of value to a new competitor, but it gives to the existing utilities a means of analyzing the local needs; of establishing a sympathetic understanding with its customers; for investigating carefully that phase of public sentiment, which whether inspired by poor service or false statements, so quickly forms the basis of discontent. Public opinion may be moulded, and so become one of the greatest factors of safety to capital and management. No methods are so effective for moulding public sentiment as those of an honest, conscientious investigation and educational canvass of the present consumers.

Methods.—Lighting companies have attempted in various ways to examine the territory supplied with their commodity. Some employ those who, in a haphazard manner, cover that portion of a community where new contracts may be procured. No reports are made, except the filing of the agreement with the prospective customer. Others attempt the canvassing of each section, by house-to-house solicitation. The salesman returning to the office a card bearing the name of the occupant, his address and the service used. Such cards are generally filed; those considered as prospective business on the right, like the sheep, but those at present supplied are as goats, placed on the left, and promptly forgotten. A few aggressive companies, knowing the value of service and the cost of connections, are anxious, not only for the new consumer, but encourage additional business with present users, by placing a premium on such revenue-producing load as occasions no service expense.

Of the three methods of accomplishing results, the first two may be classed as responsible for a large portion of the sixty million dollars annual waste; the third, as producing returns at least equal to, and usually many times the expense incurred.

The Practical Way and Its Value.—This plan consists of a house-to-house solicitation of every consumer and non-user of service, at least three to four times each year. Under such a system daily reports are filed by the salesman; each call is noted; the correct address and the name of tenant or owner also. Should the occupant be using oil, gas, or electricity, it is recorded, also whether the house is new or old, wired or unwired, the residence occupied, the service supplied, and the appliances in use.

From these reports a definite knowledge of the service, how and for what used; of the possibilities of additional business by the sale of electric iron, percolator, toaster, washing machine, range, etc.; of the lighting conditions, whether efficient, or of a type productive of such complaints as "high bills or poor service"; of public feeling co-operative or unfavorable, and how corrected is readily obtained, all for the expense generally chargeable to new business effort—moulding public opinion.

Such data can only be secured by conscientious endeavor on the part of courteous, intelligent salesmen, who believe in the value of their commodity, and whose loyalty to their firm is founded on the square deal, stimulated by appreciation for honest effort and evidenced by substantial remuneration.

Such comprehensive records are not secured without cost and a certain fixed expense is necessary to maintain in service, ever alert for good profitable business, the efficient salesman in charge of a district. A reasonable sum must be included in the yearly budget for clerical labor, that the records each day may be transcribed on appropriate cabinet cards, that lists for advertising purposes may be prepared, a careful check obtained of all appliances in use on a distribution system, and that reports on the cost of each class of commercial effort, residence, mercantile, exterior display, rural development, and industrial power may be available in determining its relative profitableness, and the advisability of increased appropriations determined.

N. E. L. A. 1915 Convention to be held at San Francisco will be attended, it is expected, by 1500 members from east of the Rockies.

The Exposition Fact Book is issued for free distribution by the San Francisco Chamber of Commerce, among those who may be instrumental in having conventions held at San Francisco in 1915. It contains considerable information of importance regarding advantages offered, railway routes, hotel rates, facilities and so forth.

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The Illuminating Engineer

We live in an age of specialization, maybe super-specialization, and so it was surprising to hear a recent lecturer on "Scientific Salesmanship" complain that he could not secure satisfactory advice upon an illumination problem although many wiring contractors, that is to say, their estimators, had been consulted. To the credit of the wiring contractors of the city in which this occurred, it should be stated that those consulted did not represent the leaders among the craft.

Moreover, the prospect knew what he wanted, but was not quite sure that it would work. He wanted his own proposal endorsed. But the system proposed did not come within the experience of those consulted, and so they suggested something which they knew would work, and were ridiculed for their well-intentioned effort.

Now the scientific salesman, if nothing else, is a specialist. Hence the surprise that a leading exponent of that science should expect a wiring estimator to advise on an engineering problem. One does not call in the bricklayer and ask him to plan the building or to pass upon proposed architectural features. That is the work of the architect, and be it noted in passing that the architect himself does not pose as a "know-all," but calls in other engineers—constructional, plumbing, electrical, heating and illuminating—to consult with him.

The reason that the architect does not handle the job alone is, to put it plainly, that it is beyond him. Yet he loses nothing by that admission. Progress in all branches of engineering, with the consequent changes, is so rapid that unless one specializes it is impossible to keep up with it all. The architect is the high priest of the crafts and directs them so that their combined effort is harmonious and complete.

It is but 34 years since the first small incandescent lamps for interior lighting were marketed, and but a few years since the high intrinsic brilliancy of the then new metal filament, or tungsten lamps, necessitated further considerations than those of illuminating efficiency, if the vision of the race was to be conserved, while artistic considerations and period treatment called for a still wider study of the science of illuminating engineering. With such a rapid growth and development complete knowledge was insured only by specialization.

It is the aim of the illuminating engineer to ensure economy of operation, combined with the relative artistic appearance of lighting installations which will at once conserve vision and permit the effective carrying out of the work for which the system of illumination is designed. The day has passed when it can be rightly said that the layman, with but a few simple rules and scientific reflectors can be his own illuminating engineer, except in unimportant installations. This is now the work of a specialist—a scientific salesman—and the more this is investigated, the more convincing it becomes.

The illuminating engineer is unprejudiced and able to devote his whole time to illumination problems, and because he does, and is available for this work, everything possible should be done to encourage him. At present his existence is not so well known that the layman uses his services to any extent; but he is

now necessary, and it is the part of wisdom that we all encourage him in his work.

Stale Statistics.

It was indeed interesting to read the report on electrical machinery and apparatus recently released by the census office and to note the remarkable increases everywhere as compared with the census last previous. Outside of that, though, the report had no value; the comparison made, the advance noted, and then the disappointment upon finding that the information was being published just four years too late.

It was as though one had read that the Government troops were defeated by rebels at Nicaragua or that Prince Ito of Japan had been assassinated by a Korean at Harbin, Manchuria, and then found to his disgust that the newspaper was a '09 edition.

Yesterday's newspaper is thrown away because the "news" is stale, and therefore comparatively unprofitable, but Government sends out to the greatest industry for its age, on earth, four years old statistics which at that late date are practically valueless. Certainly their value is not proportional to the cost of their compilation, leaving the excessive cost of publication out of the question.

Does the information published actually represent five years' work of a sufficient and skillful staff, but not unwieldly, working at the highest degree of efficiency? If so, it is certainly not worth while.

An intelligent study of reliable, up-to-the-minute statistical information will, if consistently and persistently carried out, undoubtedly result in tangible remunerative advantages. Statistical information widely and carefully gathered, properly presented and promptly disseminated, relative to conditions and prospects, and possibly actual requirements, has a strong influence in maintaining a reasonable and stable equilibrium between production and demand, with the consequent assurance of reasonable profit to the producer and just prices to the consumer. It would seem that statistical commercial knowledge is a factor calculated to eliminate from commerce any undesirable influences of uncertainty. In the past it has been deemed advisable, in order that accuracy be assured and authority invested, that such statistics be compiled by Government, but if we consider the high morality of the electrical business, the co-operation existing in all branches, and the wonderful organization which permits the prompt compilation of data of interest and its prompt dissemination, it would certainly appear that we have outgrown Government's unwieldy methods; could readily dispense with stale statistics and unprofitable.

Agricultural statistics are certainly not delayed, for, if they were, they likewise would be valueless. So important is this information considered that it must needs be anticipated, and estimates made and published in advance, as to the probable yield of the various crops, and such statistical estimates, and the reports of actual yields, are in great demand by farmers, prospective settlers, capitalists and others. They would be practically valueless, though, if published in 1913 to cover the crop season of 1909. The farmers have no organization which would permit them to collect and publish reliable nation-wide statistics. But surely organization of private interests does not justify Government neglect, and if it does, then why not entirely eliminate statistics musty with age and rely, for it actually is possible, upon the published reports or operating and manufacturing associations for reliable data brought right down to date?

Attracting New Industries

The Pacific Northwest is facing a peculiar power situation. In most Western communities the demand exceeds the supply and the problem is to finance new developments and extensions. But many of the great hydroelectric systems of the Northwest were built by courageous and progressive pioneers, actuated by the belief that utilities should precede population in a region of such rich natural resources. As a new railroad may be built to tap virgin territory, so they anticipated the power needs of this rich empire. Cheap power in abundance they now offer to all comers. Until this surplus is fully utilized the requirement would seem to be not that of developing more power, but of attracting more users.

This in turn means the establishment of new industries, not a few spectacular enterprises, but steady consumers. Electric smelting, for example, has been widely advertised as a power-consumer, but the researches of the United States Bureau of Mines show that, except for the smelting of iron ores and the manufacture of aluminum and the ferro alloys, it is still an experiment. Even the electric smelting of iron ores has not yet proven a commercial success on the Pacific Coast. So whatever market may be created from these sources is too distant to warrant present consideration. The much-heralded processes for fixing nitrogen are sufficient where atmospheric nitrogen is one of the few natural resources that the country possesses and where power is worth only from three to four dollars per horsepower year. But with their wealth of raw materials from mine, forest and farm greater things are possible in Oregon and Washington.

Labor alone is lacking. The problem of modern industry is not the distribution of the money supply, but the man supply. Money follows men. The home is the first principle of production, distribution and commerce. The automobile industry naturally gravitated to those centers of population where men were ready and willing to work and could induce immigration from more men like themselves. Here is the opportunity that should be cultivated by the great power companies of the Northwest. Let them do as the railroads have done in establishing colonization bureaus. That Northwest community which has plenty of laborers will attract industrial concerns to locate therein. No matter how plentiful the raw materials, how cheap the transportation and power, or how ready the market, satisfactory labor conditions must first be secured. Any campaign to interest prospective industries should be predicated upon and preceded by a campaign of colonization. New publics must be made for everything, and the men who make them are world-beaters.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

P. D. Callahan, salesman, Fairies Manufacturing Company, Decatur, Ill., is at San Francisco.

G. M. Reading, manager Reading Transportation Company, Hudson, Nev., is at San Francisco.

W. H. McDonell, Sacramento, Cal., is now associated with the Electrical Supply Company of that city.

C. S. Redding, of Leeds & Northrup, Philadelphia, spent the week on a business visit to San Francisco.

F. J. Somers, of the Century Electric Company, San Jose, was a visitor to San Francisco during the week.

I. L. Adelberg, Century Electric Company, St. Louis, Mo., is in California visiting all central stations and dealers in electrical machinery.

Walter Kahns, representing the J. H. White Manufacturing Company, manufacturers of fixture parts, Brooklyn, N. Y., is at Los Angeles.

Thomas Stacey, superintendent Fairview Golden Boulder Mining Company, is at San Francisco purchasing machinery and electrical equipment.

Geo. A. Sherman, storage manager of the Western Electric Company, San Francisco, returned from a trip through the Pacific Northwest this week.

C. L. Young, assistant manager Woolsey-Lovelock Light & Power Company, Lovelock, Nevada, was at San Francisco on business during the past week.

Dr. George C. Pardee of the State of California Conservation Commission, spoke at Hanford on the evening of November 7th on the new water law.

F. H. Leggett, Pacific district manager of the Western Electric Company, San Francisco, spent the last week on a business trip to Portland and Seattle.

C. F. Hartung who until recently represented the Kellogg Switchboard & Supply Company at Los Angeles, is now representing the Monarch Electric Clock system in that city.

N. I. Garrison, auditor of the Western States Gas & Electric Company at Stockton, Cal., has been appointed auditor for the Fort Smith Light & Traction Company, Fort Smith, Ark.,

Lafayette Hanchett, president of the Power Springs Company, who is prominently connected with the National Copper Bank of Salt Lake City, recently returned from an inspection of the plant.

Walter E. Jones, lighting specialist, H. W Johns-Manville Company, Seattle, has been appointed manager of the electrical department there to succeed **Frank W. Loomis,** who was transferred to Milwaukee.

W. G. Arthur Reid, Bryan-Marsh Electric Works of General Electric Company, Detroit, passed through San Francisco last week en route to Hawaii. Together with Mrs. Reid, he is making a trip around the world and expects to be away six months.

Joseph S. Wells, general manager of the Utah Light & Railway Company, and **Will Browne,** auditor, have returned from the convention of the Electric Railway Association at Atlantic City. They report a most profitable and enjoyable convention and one of the largest in the history of the association.

W. C. Orem, president Salt Lake & Utah Interurban Railway Company, took a party of prominent citizens over the route of their new interurban line between Salt Lake City and Provo. Included in the party were **Thos. R. Cutler,** general manager Utah-Idaho Sugar Company; State Senator **W. N. Williams, George Rust, Lafayette Hanchett** and **Will G. Farrell,** secretary Commercial Club.

H. R. Tobey, president N. W. Halsey & Company, New York and San Francisco, was a visitor at San Francisco and as a guest of the Pacific Gas & Electric Company visited the company's hydroelectric construction work.

Professor Harris J. Ryan of Stanford University will lecture on "High Voltage Phenomena," at the next meeting of the Associated Electrical & Mechanical Engineers, University of California, at California Hall, on November 19th at 8 p. m. The public will be welcome to attend.

Charles N. Black, vice-president and general manager of the United Railroads of San Francisco, was elected president of the American Electric Railways Association at its convention held at Atlantic City. Mr. Black is also a director of the company, a director and vice-president of the Sierra & San Francisco Power Company, president of the Monterey & Pacific Grove Railway and of the Coast Valleys Gas & Electric Company.

A. Norman, formerly manager of the Freeport (Ill.) Railway & Light Company, has been appointed manager of the Eugene Division of the Oregon Power Company with headquarters at Eugene, Oregon, effective November 15th. In this capacity he succeeds **R. M. Jennings,** who becomes manager of the Oregon Power Company at Marshfield, Oregon. **D. C. Greene,** at present manager at Marshfield, will become manager of the Everett (Wash.) Gas Company, December 1st, vice **H. H. Stephens,** resigned.

OBITUARY.

James Pass, president of Pass & Seymour, Inc., died at his home, Syracuse, N. Y., on October 30. He was a comparatively young man, being under 60 years of age and his sudden death came as a surprise to all. In 1890 he founded the firm of Pass & Seymour, Inc., and was active in its management and affairs; was also general manager of the Onondaga Pottery Company at Syracuse and a director of the First National Bank of Syracuse, N. Y.

MEETING NOTICES.

Oregon Society of Engineers.

The next meeting of the Society will be devoted to a discussion of courses of study most suited to develop the boys of the state into competent engineers. The meeting will be held in Room "A" in the new library building at Tenth and Yamhill, Thursday, November 13, at 8 p. m. The discussion is to be open to all who wish to express their ideas upon engineering education. Written discussion is desired.

Portland A. I. E. E. and N. E. L. A.

The November joint meeting of these associations was held Tuesday, November 4, at 8 p. m. in the Portland Railway, Light & Power Company's assembly room, First and Alder streets, when Mr. B. C. Condit, chief engineer Northwestern Electric Company, presented an interesting paper on the plant of the Northwestern Electric Company at Portland.

Electrical Supply Jobbers' Association.

The next meeting of the association will be held at Del Monte on Thursday, Friday and Saturday, December 4, 5 and 6. It is expected that this meeting will prove one of the most successful yet held. The secretary, Albert H. Elliot, reminds the members that it is necessary to notify him of their intention to attend this convention that adequate arrangements may be made early.

Portland Association, A. S. C. E.

E. G. Hopson, supervising engineer U. S. Reclamation Service, is president of the association, and Chas. J. McGonigle, consulting engineer, secretary. This association held its first meeting during the latter part of October at

the Portland Commercial Club. There will be three other meetings during the season.

Robert G. Deick, commissioner of public works, Portland, Ore., gave an address on the "Inefficiency of the Bancroft Bonding Law," and offered a substitute which it was claimed would save the city a considerable sum of money and be more fair to the various contractors. The Bancroft Bonding Law allows property owners five or ten years in which to pay for municipal improvements such as sewers, pavements, etc., although during that period they are required to pay interest on the deferred payments.

Utah Electric Club.

At the regular luncheon of the Utah Electric Club Thursday, October 30th, Mr. T. W. Boyer, Cashier of the Continental National Bank of Salt Lake City, and President of the Clearing House Association, spoke on the subject, "Pending Currency and Banking Legislation." Mr. Boyer was a special delegate to the Chicago convention of bankers. He has made a careful study of the bill and presented the view points of those bankers who object to the regional reserve banks and other features of the bill. It is quite likely that in order to hear both sides of the subject a supporter of the administration measure will be invited to discuss it at a luncheon of the club in the near future.

San Francisco Electrical Development and Jovian League.

Tuesday's meeting was an "enthusiastic get-together" gathering given over entirely to the transaction of Jovian Order business. The new Statesman for northern California, A. E. Rowe, presided, being assisted by retiring Statesman A. H. Halloran, who told of doings at the national convention at New York in October. The members of the degree team for the ensuing term were announced as follows: Jupiter, A. E. Drendell; Neptune, Walter Seaver; Pluto, W. L. Scobey; Vulcan, A. V. Thompson; Avrenim, Geo. Gray; Hercules; J. R. Cole; Mars, Albert Elliot; Apollo, C. F. Butte; Mercury, W. W. Hanscom; Imps, I. L. Capps, J. A. Herr, W. L. Neelands, Miles Steel, W. J. Tardiff, W. R. Dunbar. Fred H. Poss was selected by the new Statesman to act as alternate Statesman and to serve as chairman of the entertainment committee, which is to arrange for the program on Jovian days—the first Tuesday of each month. As chairman of the membership committee, Mr. G. I. Kinney was appointed, the additional members of the committee to be selected by the chairman.

Notice of a rejuvenation to be held January 10, 1914, at San Francisco was given.

TRADE NOTES.

The Kellogg Switchboard & Supply Company has opened offices in the Fernando Building, Los Angeles. L. H. Balwin is representing the company.

The McDonnell Electric Works, Sacramento, Cal., has been absorbed by the Electrical Supply Company of that city and stock and furniture are being transferred. Mr. McDonnell will take active part in outside work, both in the city and country.

NePage, McKenny & Company, electrical engineers and contractors, with offices in Spokane, Seattle, Portland, Vancouver, B. C., and Victoria, B. C., have been awarded the complete electrical installation in the new union passenger depot being constructed in Spokane by the Oregon & Washington Railway & Navigation Company. The contract amounts to approximately $7000. This depot is to be one of the finest passenger stations in the northwest, and is to be equipped with all the latest electrical innovations in the way of lighting and power. Plans are drawn up by the railway company's engineer.

At Los Angeles it was desired to electroplate some steel bars about 2 in. in diameter and 16 to 18 ft. long. A special plating tank was built but it was found that as the work had to be at a place some distance away from the regular plating dynamo, it would be almost prohibitive to carry the necessary large wires over to the special plating tank. It was finally decided to borrow 24 cells of A-8 300 amp. hr. Edison storage battery, connect these in multiple series of 3 cells each, this being done by drilling holes in a copper bar and fastening all positive terminals of each set to one buss bar and all negative terminals to the other. This made a battery of 2400 amp. hr. capacity of 3½ to 4 volts, and the special job of plating was done with entire astisfaction, practically no expense for special wiring and very little trouble in placing the battery as the Standard car lighting set of 25 cells of A-8 Edison battery weighs but 890 pounds

NEW CATALOGUES.

The quarterly calendar issued by the Crocker-Wheeler Company, Ampere, N. J., is also a convenient Speed and Frequency Table for a.c. apparatus.

The Ohio Brass Company's Bulletin for October contains considerable information regarding electric railway, transmission and mine haulage materials.

The Eichoff take-up and pay-out reels for electric light, telephone and telegraph line work is described in a pamphlet recently issued by Mathias Klein & Sons, Chicago, Ill.

A new attacment plug, Catalogue No. 785 and 786, manufactured by the Trumbull Electric & Manufacturing Company, Plainville, Conn., is featured in the latest bulletin issued by that company.

An issue of "Reactions," a quarterly published by Goldschmidt Thermit Company, contains much valuable information regarding the Thermit process of welding. New pamphlets on rail welding, pipe welding and the Goldschmidt Thermit Rail Grinder have also been published and are ready for distribution.

Bulletin No. 36 now being distributed by the Sangamo Electric Company, Springfield, Ill., deals with Sangamo Ampere Hour meters for general service. The special features and constructional details are carefully explained as are also the many uses to which this complete line may be put. A price list is included and discounts may be obtained upon application to the company.

A tastefully and artistically gotten up brochure produced by Ray D. Lillibridge, Inc., Technical Advertisers, New York City, is now being mailed. It is entitled Pioneers, and deals with pioneers in the field of electrical endeavor. The brochure is well worth sending after. Published by the Wagner Electric Manufacturing Company, it directs attention to some of the results of the pioneer work of that company also.

Bulletin No. 710-11 has been published by the Standard Underground Cable Company, Pittsburg, Pa., dealing with Davis Station (D. S.) cable terminals, designed for indoor use or for locations sheltered from direct rain. Outdoor service terminals manufactured by the same company are dealt with in Bulletin No. 700-1. The Bulletins contain full information regarding types, tests, constructional details and dimensions.

Issue No. 17 of small motors, a magazine published monthly by the industrial and power department of the Westinghouse Electric & Manufacturing Company is devoted to electric vehicles. Characteristic curves of vehicle motors are given as well as halftone views and cross sections of the different motors. Westinghouse a.c. watthour meters are fully described and illustrated in folder 4241. Lead curves of different types of meters are also shown. "Motor Driven Dairy, Creamery and Ice Cream Machinery" is the title of a pamphlet (Section 3195). Folder 4266, entitled "The Electric Breakfast Set," describes and illustrates Westinghouse toaster stove and coffee pot type percolator, and shows how easily a breakfast can be prepared by those convenient devices.

INDUSTRIAL

UNIQUE LIGHTING GLASSWARE.

An interesting development in illuminating glassware has been placed on the market by the Holophane Works of General Electric Company and consists of a translucent wall plaque

Wall Plaque.

the design being a girl's head. This should find many novel uses such as the lighting of picture theater entrances by being worked into the design of the facade, and so on. It is fourteen and one-half inches high and ten and three-eighths inches wide.

MINIATURE ELECTRIC WINDOW DISPLAY SIGNS.

Perhaps one of the most perplexing problems the retail merchant has had to deal with is a method by which his display windows might be made to appeal to the night shopper. Too often on account of the want of a medium that would appeal to the people on the street has the store been closed up for the night and the windows left in total darkness.

With the aid of the new window display signs this want is entirely overcome. Individual electric sockets, so made that they can be connected up in series, carry a small incandescent lamp and reflector. The letters of the alphabet are made of transparent glass with opaque borders, each letter plate being about 4x5 inches, and with the opaque borders stand out clear and distinct. Each reflector is equipped with grooves, into which a letter may be slipped, and by connecting together a sufficient number of these interchangeable sockets and insertion of the letter plates in their proper order, a word or sentence of any length may be made up by the window-dresser.

Demonstrations and exhibitions of this unique window invention are in progress at the Pacific States Electric Company, 575 Mission street, San Francisco.

BUENOS AIRES ELECTRICAL EXHIBIT.

The illustration shown below gives a fair idea of the excellent showing made by the Benjamin Electric Manufacturing Company at an industrial exhibition held recently at Buenos Aires. Sample boards contained the smaller units and specialties and the reflector sockets and pendant fix-

Benjamin Electric Manufacturing Company's Exhibit.

tures were suspended from the ceiling of the booth. The company's trade in South America has increased very appreciably during the past year and with a further improved market and with persistent advertising presenting this line to the trade, a still greater increase should result from now on.

WAGNER SINGLE-PHASE CONVERTER.

The Wagner Electric Manufacturing Company have placed on the market a new single-phase converter described in their Bulletin No. 103. The single-phase converter is useful for any purpose demanding direct current when only alternating current is available. For electric vehicle battery charging the control of the converter is effected by a specially designed switchboard panel which may be supplied with relays and instruments for controlling the battery charge and cutting off the current when the battery is fully charged. The converter has also found an extensive application in moving picture theaters for supplying direct current for the projection arc lamps. On account of its simplicity of starting and its synchronous running, it is being applied to X-Ray apparatus for operating the synchronous interrupter.

NEWS NOTES

INCORPORATIONS.

LOS ANGELES, CAL.—The incorporation of the Wright-Howard Electric Company is announced, the capital stock being $10,000; G. C. Wright, W. F. Howard, W. Smith are the incorporators.

PHOENIX, ARIZ.—The Rapid Transit Company has been incorporated with a capital stock of $1,000,000, by J. J. Corrigan, R. A. Campbell, C. Brady, T. H. Adams and W. S. Bradford of Phoenix.

ILLUMINATION.

MORTON, WASH.—The city council has granted F. H. Broadbent a franchise to operate an electric lighting and power plant in this city for a period of 49 years.

RICHMOND BEACH, WASH.—The application of the Edmonds Electric Light & Power Company for an electric franchise in Richhmond Beach and vicinity has been granted.

NATIONAL CITY, CAL.—Sealed bids will be received up to November 18th for lighting streets, avenues and parks of National City for a period of 5 years, beginning December 16, 1913.

PHOENIX, ARIZ.—The city council has decided to call a new bond election for November 26th. Items on which voters will ballot include $50,000 for extension of the street lighting system.

LOS ANGELES, CAL.—Sealed bids will be received up to November 17th, by the board of supervisors of Los Angeles county for installing and maintaining a system of street lighting in Moneta lighting district.

COMPTON, CAL.—The Pacific Light & Power Company has been granted a franchise to construct and maintain for a period of 50 years, an electric pole and wire system along all streets and thoroughfares in this city.

SALINAS, CAL.—The Coast Valleys Gas & Electric Company has made application for authority to issue $114,000 additional first mortgage 6 per cent bonds, in order that it may expand its plant to care for the increasing needs of consumers in the neighborhood of Salinas.

SAN DIEGO, CAL.—The railroad commission has rendered a decision granting authority to the San Diego Consolidated Gas & Electric Company to issue $27,000 of bonds under previous authorization of commission. The bonds are to be used for additions and betterments to the company's plant.

VISALIA, CAL.—The Mt. Whitney Power & Electric Company has just completed the installation of an improved modern arc light system here which is a marked improvement over the old system. The new lights are 6.6 amp. luminous arc lamps. In some of the large cities of the state, the old enclosed carbon arcs have been replaced by the 4 amp. luminous arcs, as even the 4 amp. lamps give a better light than the old carbon arc lamps. The new 6.6 amp. lamps installed by the Mt. Whitney Company in Visalia, give from two and one-half to three times the light of the old arc lamps. The company is able to take this progressive step and install these new lights without increasing the rates. In this connection, the city has increased the number of lamps from 55 to 83, and can now share the claim of Porterville as being the best lighted city for its size in the state.

TRANSPORTATION.

TACOMA, WASH.—The Seattle, Tacoma & Olympia Railroad Company, a newly incorporated organization, has filed an application for a franchise in this city for an elevated electric railroad, the line to run over practically the same territory embraced in the plan of the local traction company.

SALT LAKE, UTAH.—Grading is practically complete on the new interurban line of the Salt Lake & Utah Interurban Railway Company between Salt Lake City and Provo and it is reported that track laying operations will commence at an early date.

RICHMOND, CAL.—Two carloads of anglebars used between rails and ties in track laying were unloaded last week by the Southern Pacific Company along its main line right of way at the Cutting boulevard crossing, to be used in the construction of the railroad's interurban electric extension into Richmond.

SAN FRANCISCO, CAL.—The Sacramento Valley Railway Company has applied to the commission for a modification of its previous order, in which the commission allows the company to expend $1000 per month in organization work. The company asks for authority to expend $1250 per month for that work.

CENTRALIA, WASH.—The Washington Electric Railway Company has applied for a franchise to construct and maintain electric or other power roads, other than steam, along certain streets and roads in Lewis county beginning at the intersection of Chehalis, Summa and Grand avenues. A hearing will be given by the county commissioners November 17th.

SAN FRANCISCO, CAL.—B. F. Legare, engineer of construction for the United Railroads, has applied to the board of works for a permit to open Fulton street between Forty-ninth avenue to the Great Highway so as to complete the Fulton street tracks, which now terminate at Forty-ninth avenue. The board has referred the petition to the city engineer for a report.

OAKLAND, CAL.—The Oakland, Antioch & Eastern Railway has put into operation its new automatic electric block-signal system between Oakland and Chipp's Island. Work is in progress upon the installation of the block signals between Chipp's Island and Sacramento. This installation will establish a national record as the first interurban traction company in America to install a complete safety system of this character.

SAN FRANCISCO, CAL.—The resolution levying assessment in the matter of the construction and completion of a tunnel with approaches and appurtenances thereto and of the acquisition of lands and easements therefor, under the Twin Peaks Ridge was finally passed by the supervisors. This action clears the way for commencing construction work on the $4,000,000 subway which is to give rapid transportation facilities to the section west of Twin Peaks.

TRANSMISSION.

VANCOUVER, B. C.—The Western Canada Power Company, is raising the height of its dams on the Stave River an extra 10 ft., so as to provide storage to permit the installation of two additional generating units of 10,000 kw. capacity.

SAN FRANCISCO, CAL.—It is expected that the new Spaulding-Drum plant of the Pacific Gas & Electric Company will be ready for operation by Thanksgiving, so that as soon as the water has risen in the lake electric energy will be sent along the high-tension wires from Drum to the bay.

SEATTLE, WASH.—Burning oil in a transformer at the substation of the municipal electric light plant, burned out the feed wires, extinguishing all the street lights in the city, as well as the lights in many homes and churches last Sunday. The lights were out several hours, and in several churches services were held by candle light. The damage to the substation is said to have been trivial.

EATONVILLE, WASH.—Bids will be received at the office of Chas. C. Biggs, town clerk, up to November 14th, for the construction of a transmission line to La Grande, Wash., and distribution system in and for the town of Eatonville. Plans and specifications are on file and provisions of contract will be furnished by the Light and Water Department, city of Tacoma.

SALT LAKE, UTAH.—It is understood that the Power Springs Company has plans under consideration for increasing the capacity of its plant from 3000 to 10,000 h.p. The company is now selling most of its output to the Great Shoshone and Twin Falls Power Company. The rapid development of southern Idaho along electric lines would probably supply a market in the near future for the entire Thousand Springs development.

SAN DIEGO, CAL.—Announcement has been made of the construction within a short time of a cotton mill to cost $300,000 to utilize the cotton grown in the Imperial Valley. Within a short time 130,000 additional acres of new land will be opened for settlement in this valley, by means of the San Diego & Arizona Railroad now under construction. The railroad, which is controlled by the Spreckels interests, will run eastward from San Diego to Yuma, Ariz., connecting at the latter point with the Southern Pacific Railway. Application has just been made to the California Railroad Commission for permission to issue $15,000,000 bonds to complete the line. Forty miles have already been constructed and contracts have been let for all but ten miles of the road. Completion is promised within two years.

BOISE, IDAHO.—The Beaver River Power Company, which entered the local electrical field in opposition to the Idaho-Oregon Light & Power Company, has just sold out to the Idaho Railway, Light & Power Company, holding company of the Idaho Traction Company, which in turn controls the stock of the Idaho-Oregon Light & Power Company. The consideration was approximately $500,000. The deal is one of the largest in the power line that has taken place in this section for years, and gives the Idaho-Oregon Company complete control of western Idaho territory. The Beaver company recently changed its incorporation in western Idaho to the Idaho Power & Light Company. The deal only includes the Beaver River holdings in this section of Idaho. It was closed through S. L. Fuller, representative of Kissel, Kinnicutt & Company, who financed the Idaho Railway Company.

SEATTLE, WASH.—The secretary of agriculture has granted to the Skagit Power Company a permit for the development of two water power sites on the Skagit and Cascade Rivers in Skagit county, Washington, within the Washington national forest. It is stated by officials of the company that construction work on the Skagit project will be commenced within a comparatively short time. The construction will consist of a concrete diverting dam, 50 ft. in height, a tunnel conduit about 3.7 miles in length, and a power house on the Skagit River about 125 miles from Seattle, at which most of the power output will be marketed. In developing power from the Cascade River, the flow will be diverted by a concrete dam having a height of 20 ft. and a maximum length of about 200 ft. A flume and tunnel will carry the water a distance of approximately six miles to the proposed power house. Machinery capable of generating over 50,000 h.p. will be installed at the two power houses, according to the estimates of the engineers.

TELEPHONE AND TELEGRAPH.

OXNARD, CAL.—The Limoneira Company has been awarded a contract for the construction of 16 miles of private telephone line on ranch property.

SANGER, CAL.—The commission has granted authority to the Sanger Telephone Company to sell its property in Fresno county to Ross B. Matkins for $10,000.

MONTEREY, CAL.—The commission has granted authority to the Pacific Telephone & Telegraph Company to consolidate its telephone exchanges at Pacific Grove and Monterey.

CLIFTON, ARIZ.—The property and franchise of the Duncan Telephone Company have been sold by the sheriff under attachment, and may be merged with the Mountain States system.

SAN DIEGO, CAL.—The commission has granted authority to the San Diego Home Telephone Company to issue $150,000 in promissory notes maturing serially during a period of five years. The money is to be used to refund existing indebtedness, and to make extensions of the company's system. The company will pledge its bonds as security for the notes.

SAN FRANCISCO, CAL.—The railroad commission has granted authority to the Pacific Telephone & Telegraph Company to issue $3,000,000 bonds. The proceeds are to be used to retire underlying bonds of the Sunset Telephone & Telegraph Company and the balance is to be spent largely for improvements in the company's system in San Francisco, the San Francisco Bay territory, Los Angeles and other parts of the state.

SAN FRANCISCO, CAL.—The board of works has given the Pacific Telephone & Telegraph Company a permit to lay underground conduits in Polk street to Chestnut from its manhole at Broadway and in Chestnut street to Van Ness avenue. Thirty-five poles will be taken down. The company's conduits will be carried as far as the Exposition gates, and the city engineer says that this work will clear up the crossing at Van Ness avenue and Chestnut street so as to eliminate interference with the city railway which is to be built.

SAN FRANCISCO, CAL.—The Pacific Telephone & Telegraph Company and ten of its stockholders have filed a petition with the railroad commission, asking for a rehearing in the San Jose rate case, which was decided against the telephone company a week or two ago. The company states that the commission erred in certain calculations and that its figures do not take into consideration the actual value of the company's properties, its earnings and expenditures in the San Jose territory. In its decision the commission, referring to the contract under which the Pacific Telephone & Telegraph Company pays 4½ per cent of its gross receipts to the American Telephone & Telegraph Company, found this sum excessive and referred to it as a device to deflect earnings. In their application for a rehearing the stockholders of the Pacific company state that if the commission does not allow the company to make these annual payments the funds necessary must be taken from earnings which would otherwise be distributed to them.

WATERWORKS.

MANHATTAN BEACH, CAL.—A bond election has been called for November 22d, to vote bonds in the sum of $110,000 for a municipal water system.

MONTAGUE, CAL.—With a big interest shown here in the election to issue bonds for water works in the sum of of $25,000 the proposition carried by a vote of approximately eight to one.

OROVILLE, CAL.—The South Feather Land & Water Company, which operates above Oroville at Wyandotte, Bangor and Forbestown will begin soon the installation of 1565 ft. of 22 in. redwood syphon on the Wyandotte ditch near Forbestown.

CENTRALIA, WASH.—The city commission has announced the closing of a deal with the Weyerhouser Timber Company for an intake site and right-of-way for the proposed municipal water system, to be built from the headwaters of the north fork of the Newaukum River.